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ABSTRACT

The last of four guidebooks in the sequence, this booklet uses UICSM's "stretcher and shrinker" approach in developing place value, and four operations with decimals, conversion between fractions and decimals, and applications to measurement and rate problems. Overall goals, performance objectives for the course, teaching suggestions, and a suggested time schedule are included. Specific performance objectives for each topic are listed. Given is a bibliography of 16 references for enrichment and practice materials. For other booklets in the set, see SE 014 885 and SE 014 884. (DT)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

DOUBLE-S DECIMALS

5211.20
5212.20

MATHEMATICS

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

ED 067290

QUINMESTER MATHEMATICS

COURSE OF STUDY

FOR

DOUBLE-S DECIMALS

5211.20
5212.20

(EXPERIMENTAL)

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida 33132
1971-72

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PREFACE

The following course of study has been designed to set a minimum standard for student performance after exposure to the material described and to specify sources which can be the basis for the planning of daily activities by the teacher.

The course sequence is suggested as a guide; an individual teacher should feel free to rearrange the sequence whenever other alternatives seem more desirable. Since the course content represents a minimum, a teacher should feel free to add to the content specified.

Any comments and/or suggestions which will help to improve the existing curriculum will be appreciated. Please direct your remarks to the Consultant for Mathematics.

All courses of study have been edited by a subcommittee of the Mathematics Advisory Committee.

CATALOGUE DESCRIPTION

The last of four quins designed to develop computational skills with fractions, percents, and decimals using the "stretcher and shrinker" approach developed by the University of Illinois Committee on School Mathematics. Includes place value, the four operations with decimals, conversion between fractions and decimals, and applications.

Designed for the student who has successfully completed Double-S Fractions, 5211.15 and 5212.15.

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GOALS

1. To give the student positive, success-oriented experiences in math and increase his motivation.
2. To develop and increase the students understanding of and skills with:
   a) Place Value
   b) Basic Operations with Decimals
   c) Converting Decimals to Fractions
   d) Converting Fractions to Decimals
   e) Percent
   f) Conversion Factors
   g) Ratios and Scales
   h) Basic Graphs
3. To increase the student's communication skills with computational concepts.

PERFORMANCE OBJECTIVES

The student will --

1. Write the decimal numeral that is equivalent to a given verbal expression. (Limited to not more than three-place decimals)
2. Write the verbal expression that is equivalent to a given decimal numeral. (Limited to not more than three-place decimals)
3. Write a given decimal in expanded form.
4. Find the sum of not more than five decimals written in
   a. vertical format
   b. horizontal format

5. Find the positive difference of any two decimals written in

   a. vertical format

   b. horizontal format

6. Find the product of any two decimals of not more than three digits each.

7. Find the quotient of two decimals if the divisor has no more than two digits.

8. Round a decimal numeral to tenths, hundredths or thousandths.

9. Estimate the solutions to selected problems involving decimals.

10. Solve selected verbal problems involving decimals.

11. Indicate his appreciation of the role of mathematics in today's complex society by selecting from newspapers and periodicals examples showing the use of decimals.

12. Use equals, less than, or greater than to compare any two decimals.

13. Convert a decimal (fraction) to a fraction (decimal).

14. Convert a decimal to percent.

15. Solve rate problems, using conversion factors where required.

16. Graph a conversion factor or a rate and use it to solve problems.

17. Compute actual distances from a map scale and map distances.

STRATEGIES

Before beginning this quin, the teacher should read carefully the course description and comments contained in the Teacher's Edition and the Activities Handbook. In addition to these, the following general comments apply:

(1) Entering competencies required are: mastery of Double-S Fractions 5211.15 and 5212.15.

(2) In order to maintain student interest it is recommended that the teacher stick closely to the story line. A machine either stretches or shrinks, not multiplies or divides. The kids will realize the miltiplier and divider properties of the machines and will verbalize this. You should acknowledge the correctness of this and then go on using machine terminology. One of the major benefits of this course is its novelty, don't destroy it.

(3) The heart of the course is found in the hundreds of activities found in the Activities Handbook, activities which foreshadow, expand, drill and supplement the development found in the text. The frequent and short quizzes found in that handbook help students to gain confidence, while at the same time reviewing small blocks of pages.

(4) It is practically impossible to use all the activities in the handbook. The activities are divided into required and optional. Plan to use all the required activities and those optional activities that are appropriate to your class and the time available.

(5) It is recommended that the overhead projector be used extensively. Many of the activities utilize transparencies, and transparencies of important workbook pages should be made to assist with discussion. Transparencies of quizzes and tests are valuable, so that students can either grade each other's paper or immediate feedback and discussion opportunities can be provided.

(6) The work text should be used primarily in a class-discussion approach, hopefully utilizing the overhead projector. Too much can be lost by simply working pages. The important ideas should be expanded and emphasized.

(7) Discretion should be used in deciding whether or not to allow books to go home. It has been found effective to have row leaders distribute and collect books each day, leaving the books in the room. A beginning activity on the board can be used to expand on and review the material and to settle the students while the row leaders are distributing the books.

(8) The course was designed to be used in a work-text type program. Much thought and planning should occur before utilizing the text as non-consumable materials.

(9) Classroom supplies: Stretchers and Shrinkers

Assuming a class size of 30, the following supplies would be consumed by the class in one year. (4 quins: 5211.08/5212.08-5211.20/5212.20.)

- 30 - student sets (Book 1-4) of Stretchers and Shrinkers (if used consumably)
- 200 - index cards (3x5)
- 10 - reams of duplicator paper

The materials which follow may be used with several classes and should be saved from year to year:

- 1 - Teacher's Edition of Stretchers and Shrinkers
- 1 - Activities Handbook for Stretchers and Shrinkers
- 1 - meter stick
- 1 - yard stick
- 1 - box colored chalk
- 2 - boxes (100 sheets/box) thermal spirit masters
- 2 - boxes (100 sheets/box) transparency film for overhead projector
- 30 - scissors
- 30 - rulers (marked in inches and centimeters)
- 200 - file folders

You will also require the daily use of an overhead projector (with colored pens) and a file cabinet (at least three drawers).

STRETCHERS AND SHRINKERS

Time Schedule

Decimals

	Chapter 1		
1-16	Place Value and Decimals 1 Quiz		5 days
	Chapter 2		
17-26	Adding and Subtracting Decimals 1 Quiz		3 days
	Chapter 3		
27-36	Converting Decimals to Fractions 1 Quiz		4 days
	Chapter 4		
37-48	Multiplying with Decimals 1 Quiz		4 days
	Chapter 5		
49-66	Converting Fractions to Decimals 1 Quiz		6 days
	Chapter 6		
67-77	Dividing by a Decimal 1 Quiz		4 days
	Chapter 7		
78-84	Decimals and Percents 1 Quiz	Test	3 days
	Chapter 8		
85-93	Conversion Factors 1 Quiz		3 days

STRETCHERS AND SHRINKERS

Time Schedule

Decimals (cont.)

Book 4 (cont.)

	Chapter 9	
94-118	Rates and Problems	8 days
	1 Quiz	
	Chapter 10	
119-121	Scales	2 days
	1 Quiz	
	Chapter 11	
122-128	Graphs of Rates and Conversion Factors	3 days
	1 Quiz	
		45

3 Tests

If you finish early or feel the need to supplement any area, use the recommendations in the appendix for enrichment activities and/or computational review.

BOOK 4, CHAPTER 1: PLACE VALUE AND DECIMALS

TEXT PAGES	TOPIC	OBJECTIVE
1-3	Introducing a special coin system	Introductory.
4-7	Trading in order to get fewer coins	Given an amount of money in coins, the student can make trades to get the fewest coins (table format) for the same amount of money.
8-9	Introducing a decimal coin system	Given an amount of money in decimal coins, the student is able to make trades to express that same amount in the fewest decimal coins possible (table format).
10-13	Adding on a decimal coin table	Given two or more amounts recorded on a decimal form, the student can add to get the total, and make trades to express the total in fewest coins (table format).
14-16	Subtracting on a decimal coin table	Given two amounts of money stated on decimal forms, the student can make trades where necessary and then find the difference of the amounts (table format).

BOOK 4, CHAPTER 2: ADDING AND SUBTRACTING DECIMALS

TEXT PAGES	TOPIC	OBJECTIVE
17-18	Using the decimal point instead of the decimal coin table	a. Given an amount of money recorded on a decimal table, the student can express it in conventional decimal notation. b. Given an amount of money listed in conventional decimal notation, the student is able to record the equivalent form of a decimal table.
19-22	Adding and subtracting with decimal point notation	Given numbers in decimal notation (either horizontal or vertical format), the student is able to find their sum (difference).
23-26	Solving problems which involve decimal addition and subtraction	Given a story problem involving addition or subtraction of decimals, the student is able to identify the necessary data, select the appropriate operation, and solve the problem.

BOOK 4, CHAPTER 3: CONVERTING DECIMALS TO FRACTIONS

TEXT PAGES	TOPIC	OBJECTIVE
27-30	Reading decimals less than 1 and recording their fractional equivalents	a. Given a number less than 1 in decimal form the student is able to read the decimal numeral using conventional decimal place value language. b. Given a number less than 1 in decimal form, the student can express it in fractional form.
31-33	Comparing decimals	a. Given numbers in decimal form, the student can order them. b. Given two numbers in decimal form, the student can give a third number (in decimal form) between the given two.
34-36	Converting certain fractions to decimals and vice versa	a. Given a fraction whose denominator is a power of 10, the student can express the number in decimal form. b. Given decimals, or fractions, the student can write the corresponding fraction, decimal, or standard word form.

BOOK 4, CHAPTER 4: MULTIPLICATION WITH DECIMALS

TEXT PAGES	TOPIC	OBJECTIVE
37-39	Using decimals to label machines and sticks	Introductory.
40-42	Solving problems by using decimal machines in the forward mode	a. Given a decimal machine and a whole number input, the student can find the output and express it in decimal form. b. Given a decimal length and a whole number stretcher, the student can find the output and express it in decimal form. c. Given products of decimals and whole numbers, the student can order them.
43-47	Multiplying a decimal by a decimal	Given two numbers in decimal form, the student is able to find their product.
48	Miltiplying decimals by powers of 10	Given a decimal and a power of ten, the student can find their product.

BOOK 4, CHAPTER 5: CONVERTING FRACTIONS TO DECIMALS

TEXT PAGES	TOPIC	OBJECTIVE
49-52	Finding decimal machines to do stretching and shrinking jobs	Given a job (an input-output pair), the student can give a decimal machine to do that job.
53-57	Rounding decimals to the nearest hundredth or thousandth	Given a number in decimal form, the student is able to give the best approximation to the nearest hundredth (thousandth).
58-61	Dividing a decimal by a whole number	Given a decimal and a whole number divisor, the student is able to calculate the quotient.
62-64	Converting fractions to decimals	Given a fraction, the student can express the number in decimal form (rounding when necessary).
65-66	Adding fractions or mixed numbers by way of decimals	Given several fractions or mixed numbers, the student can convert them to decimals and find their sum or difference.

BOOK 4, CHAPTER 6: DIVIDING BY A DECIMAL

TEXT PAGES	TOPIC	OBJECTIVE
67-70	Changing a decimal divisor to a whole number divisor	Given a job specified by decimal input and output lengths, the student can use inverses to convert to an equivalent job with a whole number (input) divisor.
71-72	Solving problems which involve computing with decimals	Given a problem involving division by a decimal, the student can solve the problem and compute the answer.
73-75	Writing division problems in fraction notation	Given a decimal machine and an output length, the student is able to find the corresponding input length.
76-77	Solving problems by using decimal machines in the backward mode	Given a division problem involving decimals, the student is able to identify the important data and solve the problem.

BOOK 4, CHAPTER 7: DECIMALS AND PERCENTS

TEXT PAGES	TOPIC	OBJECTIVE
78-80	Converting percents to decimals	Given a percent machine, the student can find an equivalent decimal machine.
81-82	Using decimals to solve percent problems	a. Given two numbers, the student is able to tell what percent one is of the other. b. Given decimals (percents), the student can give the percent (decimal) equivalents.
83-84	Finding what percent one quantity is of another	Given a problem of finding what percent one quantity is of another, the student can solve it.

BOOK 4, CHAPTER 8: CONVERSION FACTORS

TEXT PAGES	TOPIC	OBJECTIVE
85-88	Introducing machines to convert units	a. Given an input (output) and a conversion factor, the student can give the corresponding output (input). b. Given an input and output in the same units, the student is able to give the conversion factor.
89-91	Using conversion facts to build conversion factor machines	Given a conversion fact (for standard length, time, weight, and liquid volume units), the student can give the corresponding conversion factor.
92-93	Using conversion factors to solve problems	Given problems requiring units conversion, the student can tell the conversion factor needed and solve the problem.

BOOK 4, CHAPTER 9: RATES AND PROBLEMS

TEXT PAGES	TOPIC	OBJECTIVE
94-96	Introducing rate machines	Introductory.
97-98	Using rate machines	a. Given a rate machine and an input (output), the student is able to give the output (input). b. Given an input and output, the student is able to give a rate machine to do the job.
99-102 103-109	Solving rate-equations Solving rate problems	Given a rate problem, the student is able to identify the rate, input, and output, to set up a rate equation, and to solve that equation (no conversions required).
110-114	Hooking up conversion factors with rate machine	Given a hookup of a rate and a conversion factor, the student is able to tell the input units and the output units, and solve problems.
115-118	Using conversion factors and rates to solve miscellaneous problems	Objective same as for pp. 99-109, except conversion factors may be included.

BOOK 4, CHAPTER 10: SCALES

TEXT PAGES	TOPIC	OBJECTIVE
119-121	Using map scale machines to solve problems	Given a map length and a scale, the student is able to tell the actual distance.

BOOK 4, CHAPTER 11: GRAPHS OF RATES AND CONVERSION FACTORS

TEXT PAGES	TOPIC	OBJECTIVE
122-125	Using graphs to picture rates and conversion factors	Given a conversion factor or a rate, the student is able to draw a graph of the conversion factor or rate.
126	Solving a rate problem with two graphs	Exploratory activity.
127-128	Summary of Book 4	The student is able to: a. add or subtract numbers in decimal notation. b. read decimal notation using standard place value language. c. convert a decimal to a fraction. d. convert a fraction to a decimal. e. multiply decimals. f. divide a decimal by a whole number. g. convert a "divide by a decimal" problem to an equivalent "divide by a whole number" problem. h. change a decimal to a percent. i. solve rate problems, using conversion factors where required.

(BOOK 4, CHAPTER 11: GRAPHS OF RATES AND CONVERSION FACTORS)

TEXT PAGES	TOPIC	OBJECTIVE
122-125 (cont.)		j. graph a conversion factor or a rate and use it to solve problems. k. compute actual distances from a map scale and map distances.

PRETEST

The posttest for 5211.15/5212.15 should serve as the pretest for this quin.

POSTTEST

In addition to the tests contained in the Activities Handbook: Activity 276 (Test 8), Activity 310 (Test 9) and Activity 342 (Test 10), it is recommended that the Skills Mastery Test contained in the Goals book, Dade County Schools Bulletin No. 7-H be administered and item-analyzed. If the answers are placed on computer cards the services of CDP (teacher-made test program) can be used for more complete test analysis. These results can then be compared with the pretest of 5211.08/5212.08 and student progress evaluated. Valuable course assessment data can this be obtained and weaknesses spotted.

Suggested Sources of Enrichment and Practice Activities

A. State-adopted textbooks

1. Crouch, William H. Coordinated Cross Number Puzzles A, B, C. New York: McCormick-Mathers Publishing Co., 1970.

2. Denholdm, R. A. and Blank, V. D. Mathematics Structure and Skills 1st Book. Chicago: Science Research Associates, 1968.

3. Foley, Jack; Jacobs, Wayne and Basten, Elizabeth. Individualizing Mathematics. Menlo Park, California: Addison Wesley Publishing Co., 1970.

Skills and Patterns

Whole Numbers
Numbers-Patterns-Theory
Sets
Fractions-Addition and Subtraction
Fractions-Multiplication and Division
Decimals-Meanings and Operations

4. Johnson, D. A., et al. Activities in Mathematics: First Course: Number-Patterns. Glenview, Illinois: Scott, Foresman and Co., 1971.

5. Sobel, Max A., et al. Essentials of Mathematics Series: Book 1. Boston: Ginn and Company, 1970.

6. Tucker and Wheeler. Mathematics Laboratory. New York: McCormick-Mathers Publishing Co., 1970.

7. Wirtz, Robert W., et al. Math Workshop Levels C, D, E. Chicago: Encyclopedia Britannica Educational Corp., 1964.

B. Non-state adopted

1. Brandes, Louis G. Yes, Math Can Be Fun. Portland, Maine: J. Weston Walch, 1960.

2. Dumas, Enoch. Arithmetic Games. Palo Alto, California: Fearon Publishers, Inc., 1960.

3. _____ . A Collection of Cross Number Puzzles.

4. Larsen, Harold. Games to Play.

5. _____ . Guzintas.

6. _____ . Ways to Multiply.

7. _____ . Brain Teasers.

Evanston, Illinois: Harper and Row, Publishers, 1961.

8. Meyer, Jerome S. "Arithmetricks." Englewood Cliffs, N. J.: Scholastic Magazine, 1965.

9. Wagner, Guy, et al. Arithmetic Games and Activity. Darien, Connecticut, 1964.